PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-070828

(43)Date of publication of application : 10.03.1998

(51)Int.Cl. H02G 15/22
H02G 15/23

(21)Application number : 08-244156

(22)Date of filing : 26.08.1996

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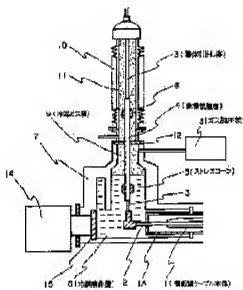
(54) TERMINAL STRUCTURE FOR CRYOGENIC CABLE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a terminal structure which eliminates the generation of an evaporation gas due to the gasification of a refrigerant liquid and which prevents a drop in an insulating performance due to the gas by a method wherein the refrigerant liquid which cools a conductor derivation rod is pressurized by a gas whose boiling point is lower than that of the refrigerant liquid.

SOLUTION: A gas pressurization device 13 is connected to a refrigerant gas layer 9, and a gas is supplied through the pressurization device 13 so as to pressurize a refrigerant liquid layer 8 which is used to cool a conductor derivation rod 2. As the gas which is used to pressurize the layer, a gas such as, e.g. helium, hydrogen, neon or the like, whose boiling point is lower than that of liquid nitrogen as a refrigerant liquid is used. In this manner, when the liquid nitrogen is pressurized by the gas, its boiling point is raised to about 84K from about 77K at atmospheric pressure when the pressure of the liquid nitrogen becomes two atmospheric pressure. Consequently, until the



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]In terminal structure of a hyperconductive cable which provided an insulating coating layer and a stress cone in a conductor cash-drawer stick which pulls out a conductor of a hyperconductive cable from a very-low-temperature part to a room temperature part, Terminal structure of a hyperconductive cable pressurizing a refrigerant solution object which cools the above-mentioned conductor cash-drawer stick by gas in which the boiling point is lower than this refrigerant solution object

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the terminal structure of the hyperconductive cable used for the power transmission cables for electric power.

[0002]

[Description of the Prior Art]Drawing of longitudinal section of an example of the terminal structure of the hyperconductive cable of the former [(b) / drawing 2] and drawing 2 (**) are the explanatory views of a problem. As for the terminal of the hyperconductive cable, cooling with a cable body and a terminal part is kicked by OFF. The conductor 2 of the main part 1 of a hyperconductive cable like the superconductivity cable cooled with refrigerant solution objects, such as high-pressure liquid nitrogen, penetrates the wrap FRP bushing insulator 1A, and the end of the above-mentioned main part 1 of a hyperconductive cable is connected with the conductor cash-drawer stick 3. And this conductor cash-drawer stick 3 passes along the refrigerant-gas layers 9, such as the refrigerant solution body whorls 8, such as liquid nitrogen in the container enclosed by the vacuum insulating layer 7, and nitrogen gas, and is pulled out outside through the fluid insulating layer 11 of SF6 grade which was prolonged in the perpendicular direction and penetrated the flange 12 and with which insulator 10 inside was filled up. The insulating coating layer 4 according [the above-mentioned conductor cash-drawer stick 3] to ethylene propylene rubber etc. from near the oil level of the refrigerant solution body whorl 8 to the middle of the fluid insulating layer 11 is given, and it is further equipped with the stress cones 5 and 6 near the both ends of the above-mentioned insulating coating layer 4.

[0003]

[Problem(s) to be Solved by the Invention]In the terminal of the hyperconductive cable of the above-mentioned structure, Since the insulating coating layer 4 and the lower end part of the

stress cone 5 which are located in the refrigerant solution body whorl 8 are formed in the shaft orientations and the perpendicular direction of the conductor cash-drawer stick 1 as shown in drawing 2 (**), When a refrigerant solution object evaporates with invasion heat or the Joule heat of the conductor cash-drawer stick 3, the evaporative gas may collect on the A section and the B section of drawing 2 (**). Generally [the insulating strength of evaporative gas and a fluid], when evaporative gas is smaller, for example, it is nitrogen, with a fluid, it is 45kV/mm, and the ratio is 9:1 in 5kV/mm in evaporative gas. When this evaporative gas **** to the refrigerant solution body whorl 8, there is a danger of insulating strength falling and resulting in a dielectric breakdown.

[0004]

[Means for Solving the Problem]This invention cancels an above-mentioned problem, provide terminal structure of a hyperconductive cable which prevented generating of evaporative gas by evaporation of a refrigerant solution object, and the feature, It is in terminal structure of a hyperconductive cable which pressurizes a refrigerant solution object which cools the above-mentioned conductor cash-drawer stick in terminal structure of a hyperconductive cable which provided an insulating coating layer and a stress cone in a conductor cash-drawer stick which pulls out a conductor of a hyperconductive cable from a very-low-temperature part to a room temperature part by gas in which the boiling point is lower than this refrigerant solution object.

[0005]

[Embodiment of the Invention]Drawing 1 is drawing of longitudinal section of the example of the terminal structure of the hyperconductive cable of this invention. In the drawing, drawing 2 (b) and identical codes express the same part. The conductor 2 of the main part 1 of a hyperconductive cable penetrates the wrap FRP bushing insulator 1A, and the end of the above-mentioned main part 1 of a hyperconductive cable is connected with the conductor cash-drawer stick 3. This conductor cash-drawer stick 3 passes along the refrigerant solution body whorl 8 and the refrigerant-gas layer 9 in the container enclosed by the vacuum insulating layer 7, and is pulled out outside through the fluid insulating layer 11 of SF6 grade which was prolonged in the perpendicular direction and penetrated the flange 12 and with which insulator 10 inside was filled up. The insulating coating layer 4 is given to the above-mentioned conductor cash-drawer stick 3 from near the oil level of the refrigerant solution body whorl 8 to the middle of the fluid insulating layer 11, and it is further equipped with the stress cones 5 and 6 near the both ends of the above-mentioned insulating coating layer 4.

[0006]In the terminal structure of this invention, the gas pressurization device 13 is connected to the above-mentioned refrigerant-gas layer 9, gas is supplied through this pressurizer 13 and the refrigerant solution body whorl 8 is pressurized. As gas used for pressurizing, the boiling point is lower than liquid nitrogen, for example, helium, hydrogen, neon, etc. are used. Thus, if the pressure of liquid nitrogen will be 2 atmospheres by pressurizing liquid nitrogen etc. by

gas, for example, the boiling point will go up from about 77K of atmospheric pressure to about 84 K. Therefore, evaporation does not take place until the temperature of liquid nitrogen amounts to 84K, but generating of gas is lost.

[0007]When invasion heat and Joule heat occur for a long time, the temperature of refrigerant solution objects, such as liquid nitrogen, rises gradually, and reaches someday at the boiling point in the pressure. Therefore, if the freezer 14 is attached to the refrigerant solution body whorl 8 via the heat exchanging part 15 as shown in drawing 1, the refrigerant solution body whorl 8 is cooled through the heat exchanging part 15 and capability of the freezer 14 is made equivalent to invasion heat or Joule heat, the rise in heat of the refrigerant solution body whorl 8 will not happen, but the evaporative gas by evaporation will be exhausted.

[0008]

[Effect of the Invention]According to the terminal structure of the hyperconductive cable of this invention, as explained above, there is no generating of the evaporative gas by evaporation of a refrigerant solution object, the fall of the insulation performance by this is also lost and a reliable terminal part is obtained.

[Translation done.]

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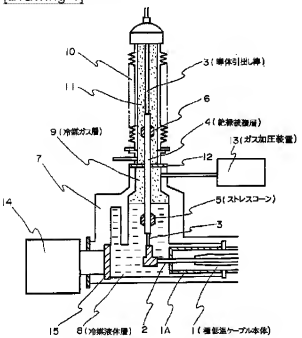
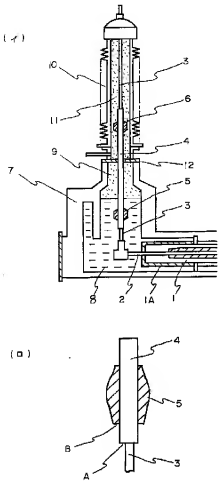
DRAWINGS

[Drawing 1]



[Drawing 2]



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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is drawing of longitudinal section of the example of the terminal structure of the hyperconductive cable of this invention.
[Drawing 2]Drawing of longitudinal section of an example of the terminal structure of the hyperconductive cable of the former [(b) / drawing 2] and drawing 2 (**) are the explanatory views of a problem.
[Description of Notations]
1 The main part of a hyperconductive cable
2 Cable conductor
3 Conductor cash-drawer stick
4 Insulating coating layer
5 and 6 Stress cone
7 Vacuum filter layer
8 Refrigerant solution body whorl
9 Refrigerant-gas layer
10 Insulator
11 Fluid insulating layer
12 Flange
13 Gas pressurization device
14 Freezer
15 Heat exchanging part

[Translation done.]